

WHAT IS CLAIMED IS:

1 1. A method of screening an individual for increased risk of low
2 folate status, said method comprising detecting a mutation in a human glutamate
3 carboxypeptidase II (GCP II) gene in a biological sample from said individual, wherein
4 detection of the mutation is indicative of decreased ability to hydrolyse a terminal
5 glutamate residue of a folypoly- γ -glutamate, which decreased ability is associated with
6 low folate status.

1 2. The method of claim 1, wherein the mutation is a single nucleotide
2 polymorphism.

1 3. The method of claim 3, wherein the single nucleotide
2 polymorphism causes an amino acid substitution of H475Y.

1 4. A method of claim 1 wherein the mutation is detected by
2 (a) amplifying the GCP II gene, or a portion thereof containing the
3 mutation, with a set of primers to provide an amplified product,
4 (b) sequencing the amplified product to obtain a sequence, and
5 (c) comparing the sequence of the amplified product with a known
6 sequence of a wild-type GCP II gene,
7 wherein a difference between the sequence of the amplified product and
8 the sequence of the wild-type GCP II gene indicates the presence of a mutation.

1 5. A method of claim 4, wherein said amplification is by polymerase
2 chain reaction.

1 6. A method of claim 4, wherein said sequencing is performed by
2 detecting the incorporation of a nucleotide into a strand complementary to a template
3 strand by detecting the presence of a pyrophosphate released from the incorporated
4 nucleotide.

1 7. A method of claim 1 wherein the mutation is detected by
2 (a) amplifying exon 13 of the GCP II gene with a set of primers to
3 provide an amplified product,
4 (b) sequencing the amplified product to obtain a sequence, and

5 (c) comparing the sequence of the amplified product with a known
6 sequence of exon 13 of a wild-type GCPII gene,
7 wherein a difference between the sequence of the amplified product and
8 the sequence of the wild-type GCPII gene indicates the presence of a mutation.

1 8. A method of claim 7, wherein said primers are
2 5'-CATTCTGGTAGGAATT TAGCA-3' and 5'-AAACACCACCTATGTTTAACA-3'.

1 9. A method of claim 7, wherein said amplification is by polymerase
2 chain reaction.

1 10. A method of claim 7, wherein said sequencing is performed by
2 detecting the incorporation of a nucleotide into a strand complementary to a template
3 strand by detecting the presence of a pyrophosphate released from the incorporated
4 nucleotide.

1 11. A method of claim 1, wherein said mutation is detected by
2 hybridizing DNA from said individual to a test nucleic acid under stringent conditions.

1 12. A method of claim 11, wherein either said DNA from said
2 individual or said test nucleic acid is immobilized on a solid support.

1 13. A method of claim 1, wherein said mutation is detected by
2 (a) amplifying exon 13 said GCPII gene,
3 (b) subjecting said amplified exon 13 to digestion by restriction
4 enzymes,
5 (c) separating the resulting restriction products to form a pattern of
6 restriction fragment lengths, and
7 (d) comparing the pattern of restriction fragment lengths to a
8 pattern of restriction fragment lengths formed by subjecting amplified exon 13 of a wild-
9 type GCPII gene to the same restriction enzymes.

1 14. A method of claim 13, wherein said separation of the restriction
2 products is by gel electrophoresis.

1 15. A method of claim 13, wherein the restriction enzyme is AccI.

1 16. A method of claim 15, wherein the pattern of restriction fragments
2 of exon 13 of the GCPII gene of the individual shows restriction fragments selected from
3 the group consisting of: 141 bases and 103 bases.

1 17. A method of claim 1, wherein said mutation is detected by
2 specifically binding an antibody to a truncated product of the GCPII gene, wherein the
3 specific binding of the antibody to the truncated gene product is indicative of a mutation
4 impairing the ability of the GCPII gene product to digest a dietary folate.

1 18. A method of claim 17, wherein detection of said specific binding of
2 said antibody and said truncated gene product is by ELISA.

1 19 A method of screening an individual for increased risk of low
2 folate status comprising

3 (a) performing reverse transcriptase-PCR on mRNA from intestinal cells
4 of the individual to amplify products of a GCPII gene, and

5 (b) determining the ratio of a variant product in which 93 bases of exon 18
6 are deleted to a normal product of the GCPII gene,

7 wherein a ratio of the variant form to the normal form greater than 1:3
8 indicates the individual is at increased risk of low folate status.

1 20. A mutation in a GCPII gene which impairs the ability of a product
2 of the gene to hydrolyse a conjugated folate to release folic acid compared to a product of
3 a wild-type GCPII gene.

1 21. A mutation of claim 20, wherein the ability of a product of the gene
2 to hydrolyse a conjugated folate is reduced by 20 percent or more compared to a product
3 of a wild-type GCPII gene.

1 22. A mutation of claim 20, wherein the mutation is a 93-base deletion
2 resulting from the elimination of exon 18.

1 23. The mutation of claim 20, wherein the mutation is a single
2 nucleotide polymorphism.

1 24. The mutation of claim 23, wherein the single nucleotide
2 polymorphism causes an amino acid substitution of: H475Y.

1 25. A kit for the detection of a woman at increased risk for bearing a
2 child with a neural tube defect, comprising:

3 (a) a container, and

4 (b) primers for amplifying a GCPII gene or portion thereof.

1 26. A kit of claim 25, further comprising instructions for detecting a
2 mutation in the GCPII gene resulting in decreased ability of a product of the GCPII gene
3 to hydrolyze a conjugated folate compared to the product of a wild-type GCPII gene.

1 27. A kit of claim 25, further comprising an AccI restriction enzyme.

1 28. A kit for the detection of an individual at increased risk for low
2 folate status, comprising:

3 (a) a container, and

4 (b) primers for amplifying a GCPII gene or portion thereof.

1 29. A kit of claim 28, further comprising instructions for detecting a
2 mutation in the GCPII gene resulting in decreased ability of a product of the GCPII gene
3 to hydrolyze a conjugated folate compared to a product of a wild-type GCPII, wherein
4 detection of such a mutation indicates the individual is at increased risk for low folate
5 status.

1 30. A kit of claim 28, further comprising an AccI restriction enzyme.